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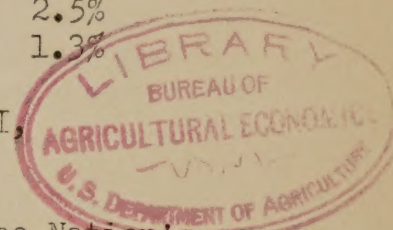
MECHANIZATION IN AGRICULTURE  
AND ITS  
EFFECT ON FARM LABOR

The rapid mechanization of wheat production before and since the turn of the century changed the pattern of agriculture on grain farms. Mechanization in the wheat crop took giant strides forward in the war years when the Nation's man power was needed at the front, when demand for grain increased and wheat prices were soaring. "Family-sized farms" which could be operated by the farmer and his family gave way to industrial grain farms, carrying heavy fixed charges of mechanical equipment, and operated much like our modern corporations.

Statistics show that larger farm units are increasing:

	1890	1935
Farms of 50 to 99 acres	24.6% of total farms	21.2% of total farm
Farms of 500 to 999 acres	1.8%	2.5%
Farms of 1,000 acres and over	0.7%	1.3%

(From U. S. Census of Agriculture, Vol. III,  
Statistics by Subjects, 1935)



This mechanization of grain farms did not upset the Nation's economic structure, for the physical frontier in the West had not yet been exhausted. Small land-holders, renters and farm laborers could always move to a homestead in the West, and we were not forced to face the problem of mechanized agriculture. Industrial expansion at this time also absorbed many agricultural workers.

A physical frontier no longer exists in the United States, but there has been no corresponding halt in mechanization. Rapid mechanical gains already made in pre-harvest operations of many crops are now spreading to harvest operations and threatening to leave millions of farm workers stranded.

A brief outline of developments in cultivation of some of the chief crops affected in areas ranging from Maine to California is summarized from the WPA National Research Project's "Summary of Findings to Date, March, 1938".

- Pattern of Mechanization in Major Crops in the United States -

An index to mechanization of agriculture is the use of the tractor which now ranges in size from small garden tractors replacing wheel hoes to large, track-type Diesel tractors doing as much work as 50 horses.



In 1930, there were over 900,000 tractors on farms and it is estimated that by 1936, there was a tractor for every fifth farm. Tractors are found in appreciable numbers in all farming areas except the Southeastern states.

### Corn

Locale - Middlewest, especially Iowa and Illinois

Reductions in labor requirements per bushel, which have occurred in almost all areas, arise out of the savings in labor requirements per acre. These savings, which averaged about 20 percent between the period 1909-1913 and 1932-1936 both for the Corn Area and the country as a whole are due primarily to the increased use of larger equipment...

Two-row cultivators have, for the most part, replaced one-row cultivators, except in the South. The most important device for saving labor in harvesting is the mechanical corn picker. One row pickers were available about 20 years ago, but not until the two-row machine became available in 1938 did it have much advantage over corn picked by hand.

In 1936, only 5 percent of the farms studied in the Corn Area used mechanical corn pickers. In 1937, many manufacturers reported more demands than they could fill. These machines will tend to displace the migratory workers who in the past spent six to eight weeks harvesting corn.

### Wheat and Oats

Locale - Level Lands of the Great Plains, the Plateaus of the Rockies, and the Far Northwest.

This level land favors mechanized farming. Labor requirements have been reduced in these crops through the use of the tractor with large-scale equipment.

It is estimated that as many as 200,000 seasonal workers found employment during the harvest up to the 1920's. Combines now make it possible for regular farm help to carry on. The combine has caused the reduction of approximately 84 million man-hours annually in the production of small grains.

The vertical or one-way disk plow, introduced in 1920, has been the most important development affecting the labor requirements in preparing the soil.

Labor required in wheat production declined by more than 50 percent between the period of 1909-13 and 1934-36, from 12.7 hours per acre to 6.1 hours per acre.



Oats are usually part of a diversified farming system and mechanization has therefore been less extensive than in wheat production. Labor requirements have been reduced by 37 percent, i.e. - from 12.5 hours in 1909-1913 of man labor per acre, to 7.9 hours in 1934-1936. Greatest reductions occurred in wheat-growing areas.

#### Potatoes

Labor requirements in the production of potatoes, another major cash crop, have been affected by the general tendency in agriculture toward the mechanization of field work. The decline in labor requirements per bushel since the war has been about 15 percent. Almost half of the farms in the country produce potatoes but less than 4.5 percent of the farms grow 200 bushels or more a year. The production of potatoes is being concentrated more and more in sections of Idaho, Colorado and Maine, and is attended by the use of transient labor for peak labor requirements. Further concentration and mechanization, particularly of the labor-consuming picking up and grading operations are anticipated.

#### Sugar Beets

Locale - Concentrated in Sections of Michigan, Colorado, Utah and California.

Labor requirements per acre have declined somewhat less than 20 percent since the pre-war period, while labor requirements per ton of beets have declined more than 20 percent. Reduction in labor requirements has been most pronounced in California (large scale farms).

As in most other crops, the displacement of animal power by the tractor and truck and the use of improved and enlarged equipment have had distinctive effects in increasing productivity.

Most of the work is still done by hand, but machines are being developed which may reduce peak labor requirements of blocking and harvesting. In some areas, these mechanical blocking machines and harvesting machines are already in use although not distributed commercially. Their development will reduce work given to agriculture laborers, hired during the harvesting season.

#### Lettuce

In 1935, California was the largest producer of lettuce with 100,000 acres planted in this crop, and Arizona next with 32,000 acres.

The pre-harvest operations of the lettuce crop are thoroughly mechanized, with the tractor and the lister completely supplanting the plow.

Mechanization is advancing into harvesting and packing operations in which large numbers of seasonal workers are employed. Newer machine methods are reducing the harvesting labor to about half of its former size



in California and Arizona. The mechanization of some operations, while hand labor is necessary in others, results in a continued need for large labor crews at certain seasons. Growers are continually trying to assure themselves of a large labor supply at irregular periods.

### Peas and Beans

Almost all operations in these crops have been mechanized. Pea and bean harvesters are being increasingly used. In 1930, the sale of pea and bean harvesters for domestic use exceeded the manufacture of the harvesting machines. Manufacture of pea and bean harvesters totalled 2,380, while the sale in the United States of these implements numbered 2,514. The market for these machines is steady. In 1936, 1,579 such machines were sold; in 1936, 1,438 were distributed; in 1937, 1,894 were sold.  
(All figures from Bureau of Census)

Improvements are being constantly made in both pre-harvest and harvest operations. Vinery harvest machinery now in use on large-scale farms is integrating all harvesting, separating and shelling operations.

### Sugar Cane

The latest crop to be affected by mechanization is sugar cane. A harvester is now in use in Louisiana which according to an eyewitness report "cut sugar cane from ten to twelve feet tall....stripped it, topped it, bunched it in piles and collected in separate piles the tops for stock feed". Its inventor, Allan Ramsey Wurtele, claims it will do the work of 50 to 60 field hands. Another sugar cane machine cutter has been invented by Joe Munson of Houma, Louisiana, who claims it will do the work of 125 men.

This harvester will affect the labor economy of Florida and Louisiana, largest producers of sugar cane.

(From TIME Magazine, Oct. 10, 1938)

### Cotton

Mechanization of the cotton crop, at present, threatens the greatest upset in our agricultural labor economy. Labor displacement in this crop originally was not feared until the perfection of the cotton-pickers. But tractors are already taking the place of the tenant, the share-croppers and the hired hand in much of the pre-harvest work. Sharecroppers and tenants are being increasingly forced off the land and swept into the ranks of seasonal laborers whose services are only wanted at time of harvest. With urban employment at a low ebb, these farm families whose ties with the land have been broken by the onslaught of mechanized farm equipment have no recourse except to take to the road in search of work.

(An index to the rapidly developing mechanization of the cotton crop is found in the increased use of tractors.)



### Increased Use of Tractors

In 1930, the sale of tractors for domestic use numbered 152,949 and was valued at \$110,555,489.

In 1937, the sale of tractors for domestic use numbered 247,370 and was valued at \$185,178,518.

(From Bureau of Census)

This increase in tractor purchases has not been absorbed by the grain-raising states, most active bidders for tractors in the past. While tractors increased 23.7 percent in the United States between 1930-37, they increased 87.9 percent in the ten Southern cotton states. In 1930, the proportion of farm tractors in the United States found on farms of the ten cotton states was 12.2 percent. In 1937, it was 18.5 percent.

(From U.S. Census, 1937, data from Farm Implement News)

The Western cotton growing area - Texas Panhandle, Mississippi and Arkansas deltas, southwestern Oklahoma, Black Wax Prairie of Texas and in some sections of Georgia and the Carolinas - because of its level or gently-rolling land and its large farm units which favor mechanization makes more extensive use of mechanical equipment than any other cotton-growing area. In this region, the purchase of tractors has almost doubled in a few years.

A survey now being conducted by the WPA, Division of Rural Research, of plantations in several counties in Texas, the largest cotton producing state and the state with most favorable conditions for mechanization, reveals the doubling of the use of tractors. Fort Bend County may be taken as a mean of the nine counties studied:

In 1934, Fort Bend County averaged	0.7	tractors on plantations.
" 1938, " " " " "	2.8	" " " "

Besides this actual increase of tractors on specific farms one must consider the extensive use which neighboring farmers make of these tractors by renting them from owners.

As a result of mechanization in pre-harvest operations, the decline in the Delta area, Black Wax region of Texas and the western semi-arid regions is sharp.

In this section:

In 1907-11	70 hours of labor were necessary per acre of cotton
In 1933-36	50 hours of labor were necessary per acre of cotton
(This figure is 38 hours less than the average for the cotton area as a whole)	

On the total acreage of cotton crop in the Western Section:

863 million hours were necessary in 1907-11 - 12,374,000 acres harvested.

673 million hours were necessary in 1933-36 - 13,443,000 acres harvested.



Mr. N. Gregory Silvermaster, Senior Economist, Farm Security Administration, who is making a study of agricultural conditions in Texas, reports:

"Since 1930, there has occurred an almost phenomenal increase of tractors in Texas, from 37,000 in 1930 to a conservative estimate of 100,000 in 1938. During the five year period, from 1930 to 1935, on the other hand, the number of sharecroppers in Texas declined 28 percent, and the number of farms from 500 acres and over increased by 4,442, and land in farms for the group by over 11,000,000 acres.

"There may be no causal relationship between these three events, the decline of sharecroppers, the increase in tractors and the increase in the number of large farms. What is reasonably certain, however, is that the increase in the number of tractors and in the number of large farms in Texas has enhanced the dependence of the Texas cotton crop upon hired labor while the displacement of sharecroppers and now of tenants, has tended to increase the available agricultural wage labor supply".

As tractors and mechanized equipment usurp the place of the hired hand or the renter on the farms in the Southwest, growers try to insure themselves of an ample supply of labor even from distant sources for the harvest season which lasts from six to ten weeks. Huge armies of cotton pickers are imported for this brief season. Since it is cheaper and quicker to work through a labor contractor, whole gangs of cotton pickers are obtained in this way.

Mr. Silvermaster's study shows that migratory labor constitutes in most cases from 60 to 90 percent of the total harvest labor.

Dr. Paul Taylor of the University of Southern California reports that he has seen "from 1,000 to 1,500 cotton hoers loaded into huge trucks in Memphis, Tennessee, to be hauled to plantations as far as 43 miles each way for the day's work. Mostly they were former sharecroppers, cut from the land".

The mobile pattern of labor being developed in the Western area of cotton-growing is not confined to a particular region. Dr. Taylor reports that 41 percent of the migrants to California have come from the three states of Oklahoma, Texas and Arkansas where mechanization of the cotton crop is being developed.

These migratory families' explanation of their plight was not the familiar refrain heard from 1935 to 1937 of "went broke", or "burned out, blowed out, eat out". Now the common explanation is "tractored out".

The perfection of a mechanical cotton picker will encourage many more farmers to invest in farm machinery, for they will no longer have to depend on hand labor for harvesting operations.



The mechanical cotton-picker may have to be reckoned with in the near future. J. D. Rust, who has patented a cotton-picker, states in a letter to a stockholder, "a self-propelled tandem machine has been incorporated (in the cotton-picker) and has solved the problem of gathering a satisfactory percentage from the row one time over. The new model has solved the problem of cotton clogging between the stripper bars and salvage devices eliminated practically all loss of cotton on the ground. We are beginning limited production this year and will expand the business as rapidly as possible".

The Rust cotton-picker has been let out to farmers in the past two years on a custom basis. Field reports from the Rust Company indicate a phenomenal decrease in the cost of picking cotton by machine as contrasted to labor methods.

The report follows:

April, 1938

Type of Machine — Self-propelled tandem  
Location — Mississippi, Louisiana and Arkansas  
Time operated — 146 hours and 16 minutes

#### Operating Costs

Operator's wages	— \$87.76; Helper's wages \$36.58	—	\$124.34
Gasoline	— 439 gallons at 12¢ per gallon	—	52.68
Oil	— 17 quarts at 17¢ per quart	—	2.85
Grease	—	—	.60
Total Operating Cost			— \$180.47

#### Comparative Results

Seed cotton picked by machine: 162,120 lbs.;	cost per 100 lbs. \$	.11
Picking by hand: 162,120 lbs. cost per 100 lbs.		1.00

Total cost of 162,120 pounds of cotton picked:

Cotton picked by hand -	\$1,619.53
Cotton picked by machine-	180.47
	<u>\$1,439.06</u>

Three varieties of cotton were picked:

Av. yield per acre	1,200 lbs
Av. amount picked by hour	1,109 lbs
Av. amount picked by minute	18 3/4 lbs.
Av. cost of picking per 100 lbs.	11¢
Total bales picked	121

The above costs of machine-picked cotton do not take in the initial cost of the machine to the planter or the cost of depreciation, as these costs have not yet been determined.



Although there still exist imperfections in the cotton-picker, we can reckon on the possibility of a practical machine in the near future. Research has been underway for some time in ginning machinery to evolve a method which would separate the cotton bolls from any leaves or twigs. Breeders are also trying to develop a cotton-plant which can be satisfactorily used with a mechanical cotton-picker. These developments would hasten the use of the cotton-picker.

The cotton crop has not awaited the perfection of the cotton picker for mechanization. Tractors are in wider use in the Western cotton region than ever before and are forcing many farmers off the land. The mobility of displaced farmers will not be the only result. A shift in the agricultural pattern is predicated with the increased use of agricultural machinery. Mechanized farm units in the Western area will tend to take over the production of cotton, and the southeastern cotton area will have to substitute other crops in its agricultural economy to survive. The shift of the cotton crop to the Southwest is recorded in the figures published by Carter Goodrich in "Migration and Economic Opportunity" (1936).

Shift in Cotton Production by Regions, 1909-1930:

	1909-12	1923-26	1927-30*
East of Mississippi			
East of Mississippi	54.2	40.5	43.7
(Includes North Carolina, South Carolina, Georgia, Mississippi, Alabama, and Tennessee)			
West of Mississippi	45.1	57.1	52.7
(Includes Missouri, Arkansas, Louisiana, Texas and Oklahoma)			

\*Decline in the Western area in 1927-30 was occasioned by the depredations of the boll weevil.

A comparison of the estimated cost of producing cotton in Western Texas and the Piedmont Section of Atlantic Coastal States follows:

	Western Texas		Piedmont Southeast	
	Hrs. per acre	Cost per acre	Hrs. per acre	Cost per acre
Man labor before harvest	16.4	\$2.05	60.4	\$6.04
Horse labor prior harvest	25.7	2.05	42.7	3.41
Man labor, harvest	20.0	2.00	60.4	6.04

(On the basis of 400 pounds seed cotton at \$0.50 per 100 in Texas, 600 lbs. at \$0.35 per 100 in the Piedmont)

Total Net Cost Per Pound Lint:	\$ .085	\$ .122
Source: Economic Status of American Cotton Producers Confidential Report of the Farm Mortgage Conference.		

The lower cost of production of cotton in the Western area will ultimately tend to wipe out the costly growing of cotton in the southeastern area.



Paul Taylor's conclusion on the effects of a mechanized cotton crop: "The pattern of social and economic effects which power farming in cotton production has produced is clear -- fewer family farms, larger farms operated by wage labor, dependence on mobile labor reserves to meet seasonal peak demands for cotton choppers and pickers.

"Many tenants who have tilled the land on the family-farm basis are made landless, forced by the machine into the towns or reduced to day labor on the farms. Large numbers who have gone to the towns have fallen on relief, or even sought refuge in distant parts. Not only is their security gone, but the opportunity even to rise to ownership is diminished, for profitable operation of mechanized farms requires more land and more capital equipment per farm."

(From - Power Farming and Labor Displacement  
in the Cotton Belt, Monthly Labor Review,  
March, 1938.)

